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MEDICINE-PACKING APPARATUS, METHOD FOR CONTROLLING THE SAME, PACKING PAPER, AND PAPER TUBE FOR PACKING PAPER
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[Claims] /2*

[Claim 1] A medicine-packing apparatus that is equipped with a medicine feeding means (1) for feeding medicine into packing paper (10) and with a thermal adhesion means (2) for thermally adhering and sealing said packing paper (10) that is filled with the medicine, said packing paper (10) having an identifier (11) that gives packing-paper information and a reading means (4) for reading said identifier (11) being provided in the aforesaid medicine packing apparatus.

[Claim 2] The medicine-packing apparatus stated in Claim 1, which is equipped with a temperature-control means for setting the temperature of the thermal adhesion means (2) based on the packing-paper information given by the identifier (11) that is read by the aforesaid reading means (4).

[Claim 3] The medicine-packing apparatus stated in Claim 1 or 2, which is equipped with a speed detection means for detecting the speed at which the aforesaid reading means (4) reads the identifier (11) and with a packing-paper control means that calculates the remaining amount of the packing paper (10) based on changes in the reading speed that is detected by said speed detection means and controls the released amount of the packing paper (10) according to the remaining amount of the packing paper (10).

[Claim 4] The medicine-packing apparatus stated in any of Claims 1 through 3, which is equipped with a printing device for printing

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given data on the aforesaid packing paper (10) and with a printing control means that controls the print setup of the aforesaid printing device according to the packing-paper information obtained from the identifier (11) that is read by the aforesaid reading means (4)

[Claim 5] The medicine-packing apparatus stated in any of Claims 1 through 3, which is equipped with an alarm means that issues an alarm when the remaining amount of the aforesaid packing paper (10) reaches below a given amount.

[Claim 6] The medicine-packing apparatus stated in Claim 1, in which the aforesaid identifier (11) is composed of a permanent magnet (21), said permanent magnet (21) being provided at the paper tube (9) of the aforesaid packing paper (10), and a magnetic-focusing permanent magnet (23) is provided for the aforesaid permanent magnet (21) in the vicinity of the aforesaid reading means (4).

[Claim 7] A method for controlling a medicine-packing apparatus that is equipped with a medicine feeding means (1) for feeding medicine into packing paper (10) and with a thermal adhesion means (2) for thermally adhering and sealing said packing paper (10) that is filled with the medicine, said packing paper (10) having an identifier (11), said method being characterized by the fact that the identifier (11) of the aforesaid packing paper (10) is read, and the temperature of the thermal adhesion means (4 [sic]) is set according to the packing-paper information obtained from the read identifier (11).

[Claim 8] The method for controlling the medicine-packing apparatus stated in Claim 7, which is characterized by detecting the speed at which the identifier (11) of the aforesaid packing paper (10) is read, calculating the remaining amount of the packing paper (10) based on changes in the detected reading speed, and controlling the released amount of the packing paper (10) according to its remaining amount.

[Claim 9] The method for controlling the medicine-packing apparatus stated in Claim 7 or 8, in which the medicine-packing apparatus is equipped with a printing device for printing given data on the aforesaid packing paper (10), and the printing position is set according to the packing-paper information obtained from the aforesaid read identifier (11) of the packing-paper (10).

[Claim 10] Packing paper that is characterized by the fact that an identifier (11) that gives packing-paper information is provided at a given position of the packing-paper main body (10a) around which the packing paper used for packing medicine is wound.

[Claim 11] The packing paper stated in Claim 10, in which the aforesaid identifier (11) is provided on a paper tube (9).

[Claim 12] The packing paper stated in Claim 11, in which the aforesaid identifier (11) is comprised of a permanent magnet (21).

[Claim 13] A packing-paper-use paper tube around which packing paper (10) for packing medicine is wound and on which an identifier (11) that gives the packing-paper information is provided.

[Detailed Description of the Invention]

[0001] [Technical Field of the Invention]

The present invention pertains to a medicine-packing apparatus, a method for controlling the medicine-packing apparatus, packing paper, and a paper tube for packing paper.

[0002] [Prior Art]

Medicine-packing apparatuses that have been used heretofore are equipped with a hopper for feeding medicine and with a heat roller or thermal compression device that pulls in packing paper that is wound around a tubular body and thermally seals it, and these apparatuses feed medicine into packing paper and thermally adhere or compress the packing paper filled with the medicine, thus creating individually packed medicine packages.

[0003] [Problems that the Invention Intends to Solve]

With the aforesaid conventional medicine-packing apparatuses, however, operators must identify the material, thickness, etc., of packing paper, and, in the process of replacing packing paper, operators need to check if the material, thickness, etc., of packing paper to be installed is the same as the one used before the replacement.

[0004] Furthermore, the thermal-adhesion temperature of packing paper varies depending on its material and thickness, but, with the aforesaid conventional medicine-packing apparatuses, if the heat roller is set to a temperature that is not suitable for the material,

thickness, etc., of packing paper, there arises the problem of improper adhesion of the packing paper.

[0005] Furthermore, to change the temperature of the heat roller, the voltage applied to the heat roller needs to be changed. Since this change is implemented according to the use condition based on empirical knowledge, this voltage change is difficult for the operator to implement, and a specialist from the manufacturer, etc., of the medicine-packing apparatus must be brought in to make this change. Thus, it is a troublesome procedure. There is also a problem in that, although the amount of packing paper that the heat roller pulls in is constant, the tension applied to the packing paper changes because the remaining amount of the packing paper gradually decreases, causing the adhesion (compression) position to deviate from the proper position or generating adhesion (compression) defects.

[0006] The present invention was achieved to solve the aforesaid problems, and it intends to identify packing paper used in medicine-packing apparatuses.

[0007] Another object of the present invention is to make it possible to set the thermal-adhesion temperature easily and reliably to a temperature that is suitable for the material, thickness, etc., of the packing paper.

[0008] Yet another object of the present invention is to feed the packing paper stably to the thermal adhesion device or thermal compression device regardless of the remaining amount of the packing

paper. /3

[0009] [Means for Achieving the Objectives]

The medicine-packing apparatus of the present invention for achieving the aforesaid objectives is, as described in Claim 1, a medicine-packing apparatus that is equipped with a medicine feeding means (1) for feeding medicine into packing paper (10) and with a thermal adhesion means (2) for thermally adhering and sealing said packing paper (10) that is filled with the medicine, said packing paper (10) having an identifier (11) that gives packing-paper information and a reading means (4) for reading said identifier (11) being provided in the aforesaid medicine packing apparatus. The packing-paper information herein means information pertaining to packing paper, including information pertaining to the kind of packing paper, information pertaining to the packing-paper material, such as glassine paper, cellophane, etc., information pertaining to the thickness of packing paper, and so forth. When the apparatus is equipped with a reading means, as described in the foregoing, the reading means (4) can read the type, etc., of the packing paper (10) and identify the packing paper (10).

[0010] When, as described in Claim 2, the medicine-packing apparatus of the present invention is equipped with a temperature-control means for setting the temperature of the thermal adhesion means (2) based on the packing-paper information given by the identifier (11) that is read by the aforesaid reading means (4), the

temperature of the thermal adhesion implemented by the thermal adhesion means (2) is appropriately set by the temperature-control means to a temperature suitable for the type, etc., of the packing paper (10).

[0011] Furthermore, when, as described in Claim 3, the medicine-packing apparatus of the present invention is equipped with a speed detection means for detecting the speed at which the aforesaid reading means (4) reads the identifier (11) and with a packing-paper control means that calculates the remaining amount of the packing paper (10) based on changes in the reading speed that is detected by said speed detection means and controls the released amount of the packing paper (10) according to the remaining amount of the packing paper (10), the packing paper (10) can be fed to the thermal adhesion means (2) with a stable tension. Therefore, this configuration can prevent packing defects, such as deviation of the adhesion position, and the like, from occurring.

[0012] When, as described in Claim 4, the medicine-packing apparatus of the present invention is equipped with a printing device for printing given data on the aforesaid packing paper (10) and with a printing control means that controls the print setup of the aforesaid printing device according to the packing-paper information obtained from the identifier (11) that is read by the aforesaid reading means (4), the print control means can be used to set the printing position, etc., appropriately for the type, etc., of the packing paper (10).

[0013] When, as described in Claim 5, the medicine-packing apparatus of the present invention is equipped with an alarm means that issues an alarm when the remaining amount of the aforesaid packing paper (10) reaches below a given amount, the alarm means can be used to inform the user of the timing for replacing the packing paper (10). Furthermore, as described in Claim 6, the medicine-packing apparatus of the present invention is configured by composing the aforesaid identifier (11) from a permanent magnet (21), said permanent magnet (21) being provided at the paper tube (9) of the aforesaid packing paper (10), and also by providing a magnetic-focusing permanent magnet (23) for the aforesaid permanent magnet (21) in the vicinity of the aforesaid reading means (4); therefore, it becomes possible to install data volume that is sufficient for expressing the packing-paper information, and, at the same time, the aforesaid magnetic-focusing permanent magnet (23) attracts the magnetic field created by the permanent magnet (21).

[0014] The method of the present invention for controlling a medicine-packing apparatus is, as described in Claim 7, a method for controlling a medicine-packing apparatus that is equipped with a medicine feeding means (1) for feeding medicine into packing paper (10) and with a thermal adhesion means (2) for thermally adhering and sealing said packing paper (10) that is filled with the medicine, said packing paper (10) having an identifier (11), and the temperature of the thermal adhesion means (4 [sic]) being set according to the

packing-paper information obtained from the read identifier (11). With this method, the thermal adhesion temperature can be set to a temperature that is suitable for the type, etc., of the packing paper (10) by reading the identifier (11) of the packing paper (10). Therefore, the temperature can be set reliably according to the material, thickness, etc., of the packing paper (10).

[0015] The method of the present invention for controlling the medicine-packing apparatus is, as described in Claim 8, characterized by detecting the speed at which the identifier (11) of the aforesaid packing paper (10) is read, calculating the remaining amount of the packing paper (10) based on changes in the detected reading speed, and controlling the released amount of the packing paper according to its remaining amount. When, as described in the foregoing, packing paper (10) has an identifier (11), and the apparatus reads the identifier of the aforesaid packing paper (10), detects the reading speed, calculates the remaining amount of the packing paper (10) based on changes in the detected reading speed, and controls the released amount of the packing paper (10) according to the remaining amount of the packing paper, the packing paper (10) can be fed to the thermal adhesion means (2) with a stable tension according to the remaining amount of the packing paper (10).

[0016] According to the method of the present invention for controlling the medicine-packing apparatus, as described in Claim 9, the medicine-packing apparatus is equipped with a printing device for

printing given data on the aforesaid packing paper (10), and the printing position is set according to the aforesaid read identifier (11) of the packing-paper (10). Therefore, by reading the packing-paper information from the identifier (11) of the packing paper (10), the printing position appropriate for the type, etc., of the packing paper (10) can be set.

[0017] The packing paper pertaining to the present invention is characterized by the fact that, as described in Claim 10, an identifier (11) that gives packing-paper information is provided at a given position of the packing-paper main body (10a) around which packing paper used for packing medicine is wound, and this configuration makes it possible to identify the packing paper together with the packing-paper main body (10a) as a unit. The packing paper pertaining to the present invention is characterized by the fact that, as described in Claim 11, the aforesaid identifier (11) can be provided on a paper tube (9), and this configuration makes it possible to identify the packing paper together with the paper tube (9) as a unit. The packing paper pertaining to the present invention is characterized by the fact that, as described in Claim 12, the aforesaid identifier (11) can be comprised of a permanent magnet (21), and this configuration makes it possible to install a data volume sufficient for expressing the packing-paper information on the paper tube (9). The packing-paper-use paper tube pertaining to the present invention is characterized by the fact that, as described in Claim 13,

the packing paper (10) for packing medicine is wound around it, and an identifier (11) that gives the packing-paper information is provided on it, and this configuration makes it possible to identify the paper tube that is suitable for the medicine-packing apparatus.

[0018] [Embodiments]

The following explains one embodiment of the present invention, referring to figures. Fig. 1 is a perspective drawing that illustrates one embodiment of the medicine-packing apparatus, and Fig. 2 is an enlarged perspective drawing of the essential parts, showing the vicinity of the paper-tube drum in Fig. 1.

[0019] The medicine-packing apparatus shown in Fig. 1 is equipped with a paper-tube drum (7) that is inserted into an approximately cylindrical hollow section (10a) that is provided at about the center /4 of the packing paper (10) that is wound around an approximately cylindrical paper tube (9), said drum being capable of rotating to release the packing paper (10); a brake plate (8) that functions as the packing-paper control means for controlling the speed of releasing the packing paper (10); a roller (6) for guiding the packing paper (10) to a hopper (1); a hopper (1) that functions as the medicine feeding means for feeding medicine into the packing paper (10); a heater (2) that functions as the thermal adhesion means (thermal compression means); and an operating panel (not shown). The packing paper used herein is glassine paper, cellophane, etc., one surface of which is coated with a synthetic resin, such as polyethylene, etc. In

the present embodiment, the heater (2) pulls in the packing paper (10) and causes the paper-tube drum (7) to rotate and release the packing paper (10) from the wound state. That is to say, the paper-tube drum (7) does not have a driving device for driving said paper-tube drum (7) proper. Incidentally, a known web-break detector pin could be provided for the paper-tube drum (7). This web-break detector pin can detect the out-of-paper state when the packing paper (10) that is wound around the paper tube (9) and inserted into the paper-tube drum (7) runs out.

[0020] On one side surface of the packing paper (10)--for example, on the right side surface in Figs. 1 and 2--are printed symbols 11 (a combination of lower-case alphabetic characters in Fig. 2), which are an example of the identifier that indicates the material, thickness, etc., of the packing paper, the temperature to be set for proper thermal adhesion, and so forth, and, to print said symbols (11), a fluorescent paint, for example, is used that emits light only when it is exposed to near-ultraviolet radiation whose wavelength is from 300 to 400 or thereabouts and becomes visible.

[0021] In addition, in the medicine-packing apparatus of the present invention are provided, as shown in Fig. 1, in the vicinity of the packing paper (10), a device. such as a black light (5), etc., for emitting near-ultraviolet radiation to expose the side surface of the packing paper (10) on the side of which the symbols (11) are printed and also an image sensor (4) as the reading means that reads the

symbols (11) by receiving the light from the aforesaid symbols (11) that emit light when exposed to near-ultraviolet radiation from said black light (5). The means for emitting near-ultraviolet radiation may be comprised of a xenon lamp to which a filter is attached, ultraviolet LED, etc.

[0022] The medicine-packing apparatus is further equipped with a microcomputer (not shown in Fig. 1), which stores information pertaining to the packing paper that is suitable for this medicine-packing apparatus. The data pertaining to the symbols (11) that are read by the image sensor (4) is transmitted to the microcomputer. Fig. 3 is a block diagram that illustrates the connection relationship of the microcomputer (12), and the following explains the microcomputer (12), referring to Fig. 3. First, the microcomputer (12) is connected with the heater (2), as shown in Fig. 3, and also stores in advance a proper heater (2) temperature for each set of symbols (11), that is to say, for each packing-paper (10) information, and the temperature of the heater (2) is set according to the symbols (11) that are read by the image sensor (4).

[0023] Secondly, the microcomputer (12) is connected with the brake plate (8), as shown in Fig. 3, and the paper-feed speed at which the packing paper (10) is released from the paper-tube drum (7) and pulled into the heater (2) is set and memorized in it in advance as a predetermined speed. Therefore, the speed at which the heater pulls in the packing paper (10) is practically about the same as the paper-feed

speed. The microcomputer (12) detects the reading speed (which will be described later) of the symbols (11) that are input from the image sensor (4) and controls the magnitude of the pressing force of the brake plate (8) against the packing paper (10) in such a manner as to set the paper-feed speed to the aforesaid predetermined speed and also to make the tension of the packing paper (10) constant. More specifically, with the present medicine-packing apparatus, the heater (2) pulls in the packing paper (10) to feed the packing paper (10), and, as a result, tension decreases when the remaining amount of the packing paper (10) becomes smaller and the weight that is applied to the paper-tube drum (7) becomes lighter, thus causing the paper feeding to become faster. Accordingly, the control of the paper-feed speed is achieved by controlling the magnitude of the pressing force of the brake plate (8).

[0024] The following explains the method for packing medicine with the medicine-packing apparatus thus configured. First, the paper-tube drum (7) around which the packing paper (10) is wound is installed at a given position, and the packing paler (10) is brought to where the roller (6) is located and attached to it. Thereafter, the black light (5) and image sensor (4) are turned on by operating switches, etc., that are installed on an operating panel that is provided in such a manner that the user can operate it.

[0025] The image sensor (4) is set so as to receive images constantly, and the image sensor (4) reads the symbols (11) of the

packing paper (10) and transmits the data to the microcomputer (12). The microcomputer (12) identifies the packing-paper information that is indicated by the symbols (11) that are read by the image sensor (4), and, if this information is different from the packing-paper information that has been stored in the microcomputer (12), the microcomputer (12) issues a display signal so as to cause the display device (not shown), which functions as the alarm means, mounted on the operating panel, etc., to indicate the error, after which the microcomputer shuts down the medicine-packing apparatus.

[0026] If the symbols (11) that are read by the image sensor (4) in the aforesaid manner agree with what is stored in the microcomputer (12), the paper-feed speed is detected next. More specifically, the microcomputer (12) detects, inside the microcomputer (12), the speed at which the symbols (11) are read--in other words, the intervals (timing) at which the data of the symbols (11) is transmitted to the microcomputer (12), and it determines whether the detected reading speed is within a predetermined speed range. More specifically, as the symbols (11), on one side surface of the packing paper (10), characters or barcodes are printed in the diameter direction, as shown in Figs. 2, 4, and 5, and the distance between characters or barcodes becomes wider toward the outer periphery of the packing paper (10). Here, each barcode is comprised of thick line segments, thin line segments, and blank areas therebetween that are arranged parallel to one another, and it is printed in a manner that allows an ordinary

barcode reader to read it. Accordingly, the length of the interval between the characters or barcodes varies depending on whether the printing position of the characters, etc., is near the outer periphery or inner periphery. Therefore, by detecting the length of this /5 interval, the speed of the packing paper (10) can be detected indirectly. That is, the microcomputer (12) functions as the speed detection means that detects the speed at which the image sensor (4) reads the symbols (11).

[0027] The following explains the control of the medicine-packing apparatus by the microcomputer (12) after the reading speed has varied and after it has been detected whether the reading speed is at a predetermined speed or not. First, when the speed at which the image sensor (4) reads the symbols (11) is out of a given speed range--for example, when it is faster--an adjustment for increasing the pressing force of the brake plate (8) against the packing paper (10) is made so as to bring said reading speed to within a given speed range, and, if the reading speed is not out of a given speed range, the packing paper (10) is released at the current speed. If the reading speed is slower than a given speed, an adjustment for reducing the pressing force of the brake plate (8) is made, after which the packing paper (10) is released.

[0028] Furthermore, when the aforesaid reading speed oversteps the given speed range, the microcomputer (12) calculates the remaining amount of the packing paper based on the reading speed and based on

the time since the start of the packing-paper release. Then, when a given time elapses from the time at which the aforesaid reading speed overstepped the given speed range, the remaining amount of the packing paper starts to be displayed in several stages, each stage for indicating a different remaining-amount level, and, when the remaining amount becomes insufficient to continue package adhesion, the microcomputer causes the aforesaid display device (not shown) to indicate the error. Alternatively, to detect the remaining amount, the area in which the identifier is provided is kept out of the position of a given number of turns of the packing paper from the start of the wound packing paper, and the microcomputer considers this given number of turns as the remaining amount and determines that there is no remaining amount when the packing paper is reduced to this given number of turns (that is, when the identifier cannot be detected). As another method, a specific identifier may be set at the position of a given number of turns, and the microcomputer may start to display the remaining amount in several stages, each stage for indicating a different remaining-amount level, when this specific identifier is detected. By adjusting the pressing force of the brake plate (8), as described in the foregoing, the slack or stretch of the packing paper (10) can be prevented, and the tension of the packing paper (10) is maintained at about a constant level. As a result, there is less possibility of causing defects, such as adhesion position deviation, etc., that have heretofore occurred due to the unstable tension of the

packing paper (10) that is wound around the paper-tube drum (7), thus improving packing precision.

[0029] Next, if the speed at which the image sensor (4) reads the symbols (11) is within a given speed range, the hopper (1) feeds the medicine into the packing paper, and the packing paper (10) is conveyed to the heater (2) side.

[0030] The temperature of the heater (2) is set by the microcomputer (12) based on the symbols (11) read by the image sensor (4) and regulated appropriately for the material of the packing paper (10). To the heater (2) whose temperature is controlled in the aforesaid manner, the packing paper (10) is conveyed, and the medicine is sealed in the packing paper (10). Thus, the microcomputer (12) sets the heater (2) to a temperature that is suitable for the material and thickness of the packing paper; therefore, thermal adhesion can be carried out properly, without having insufficient adhesion, etc. As seen in the foregoing, the microcomputer (12) also functions as the temperature control means for setting and controlling the temperature of the heater (2).

[0031] In this manner, medicine is packed into individual packages by the medicine-packing machine.

[0032] In the present embodiment, various types of packing-paper materials are stored in advance in the microcomputer as given packing-paper information. However, some types of medicine are required to be packed with packing paper of a certain predetermined kind, and, in

this case, by storing the identifier that indicates the predetermined material, the microcomputer can cause an error to be displayed when the image sensor reads an identifier that is different from this stored identifier. Here, the medicine-packing apparatus may be shut down. By thus controlling the operation of the medicine-packing apparatus according to the material, etc., of the packing paper, the correct packing paper for the type of medicine can be used reliably to pack the medicine.

[0033] If a printing device for printing dosing time, etc., on packing paper is provided to the aforesaid medicine-packing-apparatus embodiment and the print setup, such as printing position, etc., for each set of symbols (11) is stored in the microcomputer (12), it becomes possible for the microcomputer (12) to automatically implement the print setup according to the type of the packing paper. That is, it is also possible to configure the microcomputer (12) to function as the printing control means.

[0034] Furthermore, in the aforesaid embodiment, based on the identifier read from the packing paper, the microcomputer (12) implements the heater temperature setup, adjustment of the release amount of the packing paper, printing position setup, etc., but it is not essential to carry out all of these setups, and the microcomputer (12) may be configured so as to implement a minimum of one among the aforesaid setups.

[0035] In Fig. 1, the image sensor (4) is positioned on the near side of Fig. 1, while the black light (5) is positioned on the back side. However, the positional relationship of the image sensor and black light can be the reverse of the relationship shown in Fig. 1, or they may be positioned one above the other.

[0036] In the aforesaid embodiment, the reading means is comprised of an image sensor, but the reading means can be changed as appropriate to, for example, photoreceptors, such as photodiodes, etc. In the case of using photodiodes, as mentioned in the foregoing, the reading means can be configured less expensively than configuring it from an image sensor by adopting the configuration in which two photodiodes, for example, are used and in which the identifier is composed of a combination of line segments and spaces, like a barcode, the aforesaid two photodiodes being used to detect the space between the presence and absence [sic] of the line segments. The number of photodiodes is not limited to the aforesaid two and can be changed as appropriate, and the method for reading identifiers can also be changed as appropriate.

[0037] In the aforesaid embodiment, a black light that emits ultraviolet radiation is provided in the medicine-packing apparatus, /6 and the identifier that emits light when the black light is applied to the packing paper is read by an image sensor, which functions as the reading means, but the reading means is not limited to this. The reading means can be changed according to the mode of the identifier,

and, if, for example, the identifier is composed of a barcode, a barcode reader can be used as the reading means, and the black light is not necessary in this case.

[0038] Furthermore, with respect to the reading means, an image-processing device, for example, may be used as the device that imports an identifier, compares it with the identifier that has been stored, and detects the meaning of its symbols when these identifiers are found to match.

[0039] Furthermore, the mode of implementing the identifier is not limited to printing it on the packing paper, and, for example, when a synthetic resin used for thermal adhesion is applied to glassine paper, etc., in the process of forming packing paper, a fluorescent paint may be selectively provided at the edge, etc., of the packing paper, or a fluorescent paint that is formed in an identifier shape may be attached to the edge, etc., of the packing-paper main body (10a). In addition, the identifier is not limited to a combination of alphabetic characters, as shown in Fig. 2, and may be formed from geometric symbols (11a), such as circles, triangles, etc., as shown in Fig. 4 (a), from barcodes (11a), as shown in Fig. 4 (b), or from logos (11c), such as company names, etc., as shown in Fig. 5. In short, the present invention can employ any symbols that can indicate the type, etc., of the packing paper. Furthermore, the same arrangement of symbols, such as the logo (11c) shown in Fig. 5, and the like, can be used as the identifiers for all types of packing

paper. In this case, the spacing of the arrangement or size of symbols, such as logos, etc., is changed according to the type, such as material, thickness, etc., of packing paper (10), and the reading means determines the type concerned. In this manner, the same symbol arrangement can function as identifiers for different types.

[0040] In addition, the ink used for printing identifiers is not limited to fluorescent materials, such as fluorescent paints, etc., and it can be ordinary black ink, magnetic ink, etc.

[0041] However, forming identifiers from a fluorescent material, such as the aforesaid fluorescent paint, etc., is advantageous because, in the case of printing packing paper, the identifiers do not interfere with prints by, for example, blocking them, and packing paper with good appearance can be produced.

[0042] In addition, the packing-paper information indicated by the identifier is not limited to the aforesaid material, thickness, thermal adhesion temperature, etc., and it can be changed as appropriate by, for example, adding any information, such as the width, etc., pertaining to the packing paper. Furthermore, the packing-paper information does not have to contain all of the aforesaid information items, and the information that contains a minimum of one among the material, thickness, width, etc., of the packing paper is sufficient.

[0043] In the aforesaid embodiment, the identifier is printed on the side surface of the packing paper that was wound in an approximately cylindrical shape. However, the printing position of the

identifier is not limited to the side surface, and, as shown in Fig. 6, it may be the border (10b) of one surface of the packing paper. However, in this case, as in the cases shown in Figs. 2, 4, and 5, the identifiers should be printed in such a manner that the intervals between the identifiers are shorter [as shown in (b) in Fig. 6] on the inner periphery side and longer [as shown in (a) in Fig. 6] on the outer periphery side when the packing paper is wound around the paper-tube drum and that characters or barcodes are so arranged that the space between them becomes wider as they get closer to the outer periphery of the packing paper (10). Furthermore, the printing position of the identifiers may be at both borders, the center of the surface, etc., and, furthermore, they can be printed on both surfaces, not limited to one surface.

[0044] If the printing is implemented in the aforesaid manner, the installation position of the identifier reading means should be changed according to the position at which the identifiers are printed.

[0045] Furthermore, as another mode of providing identifiers, the present medicine-packing apparatus can be configured, as shown in Fig. 7 (b), by providing permanent magnets (21) at the end face of the paper tube (9) and also by providing a magnetic detection means (22), such as a hole sensor, etc., as the reading means in such a manner that it faces the paper tube (9) so as to be able to detect the magnetic field generated by the aforesaid permanent magnets (21). In this case, the type, etc., of the packing paper (10) can be expressed

by a combination of the number, polarity, etc., of the permanent magnets (21), the magnitude of the magnetic force thereof, the distance therebetween, etc., as in the case of the aforesaid barcode (the "magnitude of the magnetic force" corresponds to the thickness of the line segments, and the "distance" corresponds to the blank space), and each combination is set to correspond one-to-one with each identifier. According to this setting, the permanent magnets (21) are provided at the side face or end face (one end portion of the circumferential curved surface) of the paper tube (9), and the hole sensor reads the aforesaid magnetic field digitally, thus detecting the identifier as a read pattern, and, based on this read pattern, the type, etc., of the packing paper can be identified. To install these permanent magnets (21) on the paper tube (9), they may be embedded into the paper tube (9), or what is called a sheet magnet may be utilized. For example, a plurality of permanent magnets (21) can be provided on both end surfaces of the paper tube (9), as shown in Fig. 7 (b), and, moreover, the number, the magnitude of magnetic force, and installation angle (ψ) may be set differently between one end (21a) and the other end (21b). More specifically, the installation angle (ψ), for example, may be set to 0 and 60 degrees for one end (21a) and 0 and 90 degrees for the other end (21b) to increase the information capacity of the read pattern, thereby making it possible to set data volume sufficient for indicating the packing-paper information at the paper-tube drum (7); as a result, the packing-paper information can be

set with a minimum increase of component cost. Utilizing both ends, as described in the foregoing, makes it possible to increase the data volume that can be set by providing an identifier and, consequently, to handle various types of packing paper. Furthermore, it also has an advantage in that, when the paper tube (9) is inserted into the paper-tube drum (7), the compatibility of the paper tube and the medicine-packing apparatus can be determined, thereby identifying proper packing paper, and also in that it becomes possible to check if the tube is properly inserted or not. For these permanent magnets (21), the magnetic detection means (22) as the reading means (4) is provided near the paper tube (9), as in the case of providing an image sensor, so as to read the magnetic information of the permanent magnets, and, as shown in Fig. 7 (a), a permanent magnet (23) for magnetic focusing use can be additionally provided for the aforesaid permanent magnets (21) in the vicinity of the magnetic detection means (22). The vicinity herein could be, for example, the back of the magnetic detection means (22) when viewed from the permanent magnets (21), and it means that the distance of the magnetic-focusing permanent magnet from the magnetic field of the permanent magnets (21) should be set according to the magnitude of the magnetic force of the permanent magnets (21) so that the magnetic-focusing permanent magnet can act on the magnetic field generated by the permanent magnets (21). Providing /7 a magnetic-focusing permanent magnet (23) for the permanent magnets (21), as described in the foregoing, has an advantage in that data

volume sufficient for expressing packing-paper information can be achieved by the permanent magnets (21) and also in that the aforesaid magnetic-focusing permanent magnet (23) exerts the effect of attracting the magnetic field (lines of magnetic force) generated by the permanent magnets (21), thereby making it possible for the magnetic detection means (22) to reliably detect the magnetic information that is expressed by the permanent magnets (21).

[0046] Incidentally, these permanent magnets (21) can also be utilized for detecting the paper-feed speed. In this case, the aforesaid read pattern needs to be detected repeatedly, but, by detecting the period of this repetition, the paper-feed speed can be detected easily. As yet another mode of identifier, metal pieces (not shown) may be utilized in the place of permanent magnets (21), and a metal detection means may be provided in the place of the magnetic detection means.

[0047] As described in the foregoing, by providing the identifier at a given position of the main body of packing paper used for packing medicine, the packing paper can be identified together with the packing-paper main body as a unit, and this makes it easier to implement sanitary management or inventory control. If the aforesaid identifier is provided on the end face of the paper tube, the packing paper can be identified together with the paper tube (9) as a unit. Therefore, it is advantageous for production control in which the paper tube (9) is recycled. The thermal adhesion means is not limited

to the aforesaid heater and can be changed as appropriate to, for example, a commonly used thermal compression device, etc., such as a compression sealing device, etc.

[0048] Furthermore, when an error occurs, the display device is used in the aforesaid embodiment to display the error, but the alarm means can be changed to a buzzer, etc., as appropriate.

[0049] If packing paper to which an identifier is provided is manufactured at a given place, such as a plant, etc., and sold, this identifier, like production lot numbers, can be utilized for production control, thus making it possible to know the sales channels and making it easier to implement sanitary management and inventory control.

[0050] [Effects of the Invention]

With the medicine-packing apparatus pertaining to the present invention, the type of packing paper can be identified by the reading means.

[0051] When, as described in Claim 2, the medicine-packing apparatus of the present invention is equipped with a temperature-control means for setting the temperature of the thermal adhesion means based on the packing-paper information given by the identifier that is read by the aforesaid reading means, the temperature of the thermal adhesion implemented by the thermal adhesion means is appropriately set by the temperature control means to a temperature suitable for the type, etc., of the packing paper.

[0052] Furthermore, when, as described in Claim 3, the medicine-packing apparatus of the present invention is equipped with a speed detection means for detecting the speed at which the aforesaid reading means reads the identifier and with a packing-paper control means that calculates the remaining amount of the packing paper based on changes in the speed that is detected by said speed detection means and controls the released amount of the packing paper according to the remaining amount of the packing paper, the packing paper can be fed to the thermal adhesion means with a stable tension.

[0053] When, as described in Claim 4, the medicine-packing apparatus of the present invention is equipped with a printing device for printing given data on the aforesaid packing paper and with a printing control means that controls the print setup of the aforesaid printing device based on the packing-paper information obtained from the identifier that is read by the aforesaid reading means, the print control means can be used to set the printing position, etc., appropriately for the type, etc., of the packing paper.

[0054] When, as described in Claim 5, the medicine-packing apparatus of the present invention is equipped with an alarm means that issues an alarm when the remaining amount of the aforesaid packing paper reaches below a given amount, the alarm means can be used to inform the user of the timing for replacing the packing paper. Furthermore, as described in Claim 6, the medicine-packing apparatus of the present invention is configured by composing the aforesaid

identifier from a permanent magnet, said permanent magnet being provided at the paper tube of the aforesaid packing paper, and it is also possible to provide a magnetic-focusing permanent magnet for the aforesaid permanent magnet in the vicinity of the aforesaid reading means; therefore, it becomes possible to install data volume that is sufficient for expressing the packing-paper information, and, at the same time, the aforesaid magnetic-focusing permanent magnet (23) attracts the magnetic field created by the permanent magnet (21), thereby making it possible to reliably detect the magnetic information expressed by the permanent magnet at the paper tube.

[0055] According to the method of the present invention for controlling a medicine-packing apparatus, as described in Claim 7, the identifier of the packing paper is read, and the thermal adhesion temperature is set according to the packing-paper information obtained from said read identifier; therefore, the thermal adhesion temperature that is suitable for each packing paper can be set by reading the identifier of the packing paper. Consequently, the temperature can be set reliably according to the material, thickness, etc., of the packing paper (10), and the number of defective products can be reduced.

[0056] According to the method of the present invention for controlling the medicine-packing apparatus, as described in Claim 8, packing paper has an identifier, and the apparatus reads the identifier of the aforesaid packing paper, detects the reading speed,

calculates the remaining amount of the packing paper based on changes in the detected reading speed, and controls the released amount of the packing paper according to the remaining amount of the packing paper. This makes it possible to feed the packing paper to the thermal adhesion means with a stable tension according to the remaining amount of the packing paper. Consequently, packing precision improves.

[0057] According to the method of the present invention for controlling the medicine-packing apparatus, as described in Claim 9, the medicine-packing apparatus is equipped with a printing device for printing given data on the aforesaid packing paper, and the printing position is set according to the aforesaid read identifier of the packing-paper (10). Therefore, by reading the identifier of the packing paper, the printing position appropriate for the type, etc., of the packing paper can be set. The packing paper pertaining to the present invention is characterized by the fact that, as described in Claim 10, an identifier that gives packing-paper information is provided at a given position of the packing-paper main body around which packing paper used for packing medicine is wound, and, since this configuration makes it possible to identify the packing paper together with the packing-paper main body (10a) as a unit, sanitary management or inventory control can be implemented easily. The packing paper pertaining to the present invention is characterized by the fact that, as described in Claim 11, the aforesaid identifier can be provided on the side surface of the paper-tube drum, and, since this

configuration makes it possible to identify the packing paper together with the paper-tube drum as a unit, it is advantageous for production control, etc., in which paper-tube drums are recycled. The packing paper pertaining to the present invention is characterized by the fact that, as described in Claim 12, the aforesaid identifier can be comprised of a permanent magnet, and, since this configuration makes it possible to install data volume sufficient for expressing the /8
packing-paper information on the paper-tube drum, packing-paper information can be set with a minimum increase of component cost. The packing-paper-use paper tube pertaining to the present invention is characterized by the fact that, as described in Claim 13, the packing paper for packing medicine is wound around it, and an identifier that gives the packing-paper information is provided on it, and, since this configuration makes it possible to identify the paper tube that is suitable for the medicine-packing apparatus, the proper packing paper can be identified. In addition, the paper tube can be checked to see if it is properly mounted in the paper-tube drum.

[Brief Explanation of the Drawings]

[Fig. 1] A perspective drawing that illustrates one embodiment of the medicine-packing apparatus pertaining to the present invention.

[Fig. 2] An enlarged perspective view of the essential parts.

[Fig. 3] A block diagram that illustrates the connection relationship of the microcomputer.

[Fig. 4] (a) and (b): perspective drawings that illustrate other embodiments of the identifier.

[Fig. 5] A perspective drawing of yet another embodiment of the identifier.

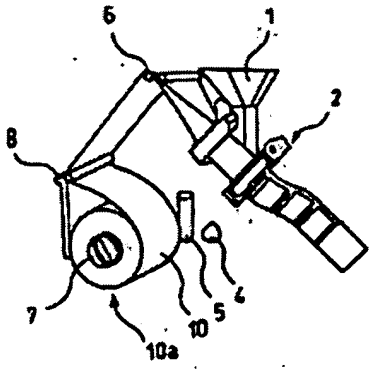
[Fig. 6] (a) and (b): perspective drawings that illustrate another embodiment of the packing paper on which the identifier is provided, (a) illustrating the outer periphery side and (b) the inner periphery side.

[Fig. 7] (a) and (b): perspective drawings that illustrate yet another embodiment of the packing paper on which the identifier is provided, (a) illustrating a condition in which there is packing paper and (b) a condition with no packing paper.

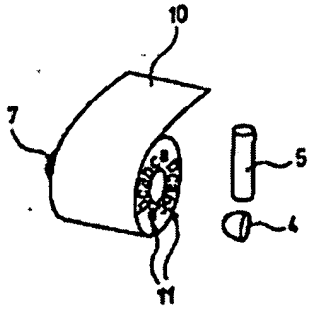
[Explanation of Reference Numerals]

1 … a hopper, 2 … a heater, 4 … an image sensor, 7 … a paper-tube drum, 8 … a brake plate, 9 … a paper tube, 10 … packing paper, 11 … a symbol, 12 … a microcomputer, 21 … a permanent magnet, 22 … magnetic detection means.

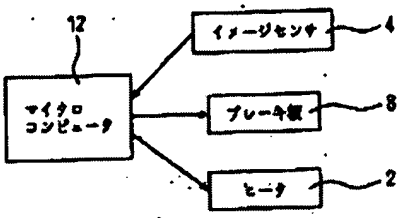
[FIG. 1]



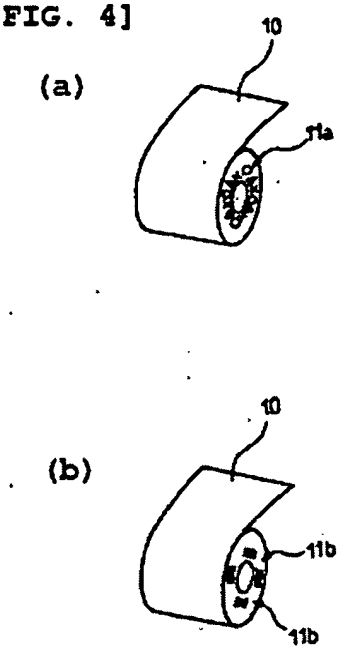
[FIG. 2]



[FIG. 3]

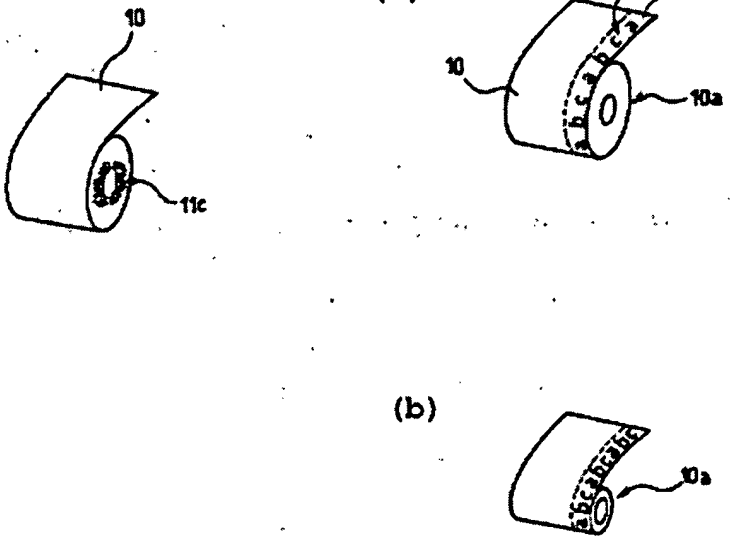


[FIG. 4]



[FIG. 5]

[FIG. 6]



Key: 2) heater; 4) Image sensor; 8) brake plate; 12) microcomputer.

[FIG. 7]